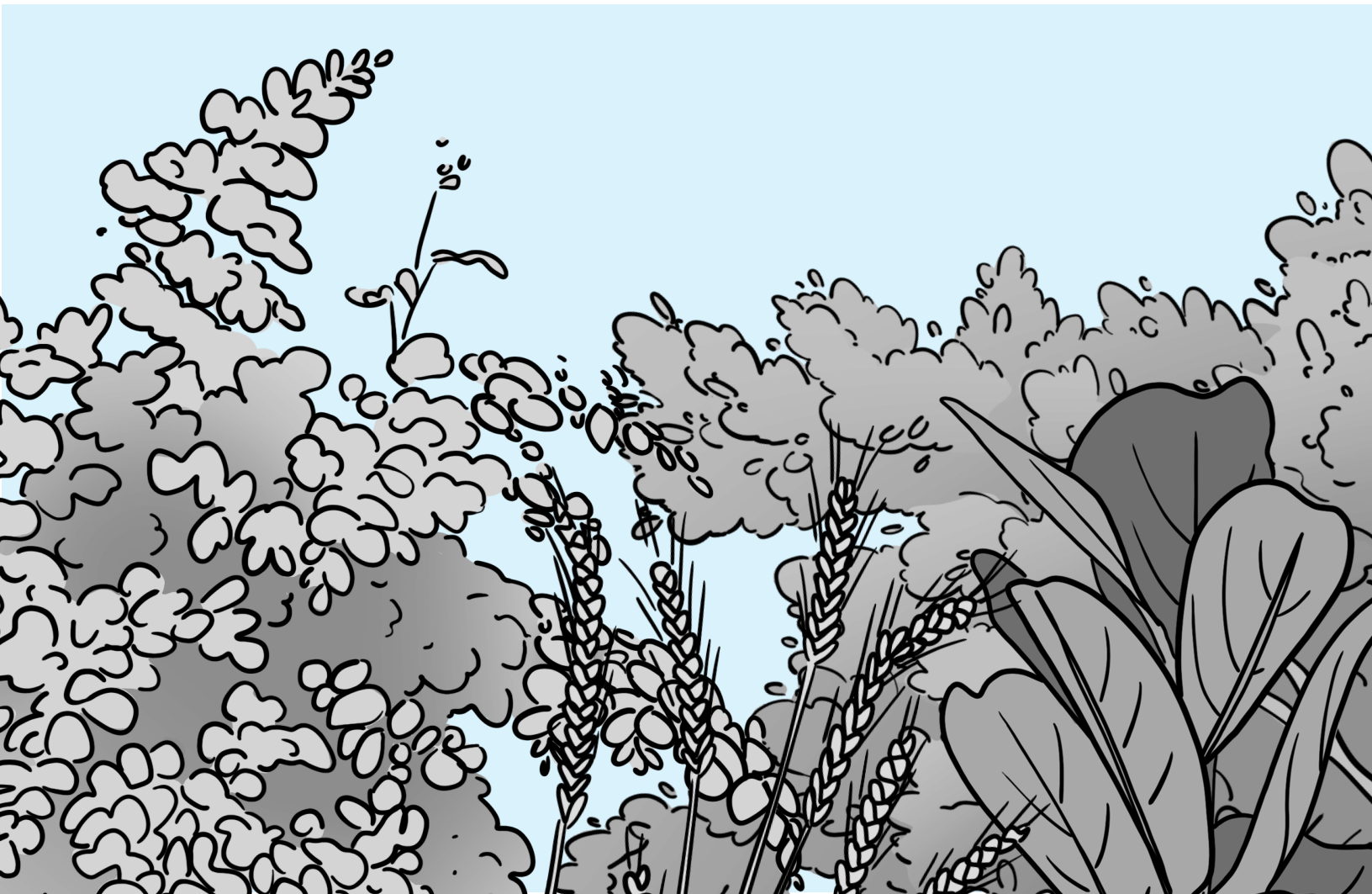
Macroinvertebrate Discovery Games

NOOKSACK SALMON ENHANCEMENT ASSOCIATION



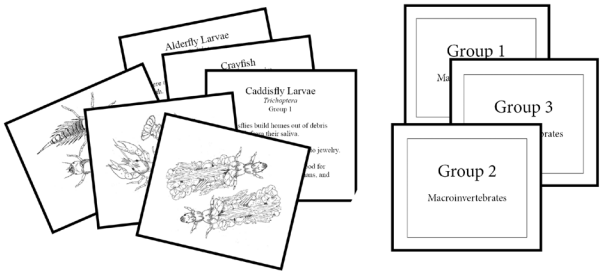
Macroinvertebrate Cards

What is a macroinvertebrate?
"Macro" means big enough that we can see the creature without a microscope. "Invertebrate" means the creature is lacking a spine. In this case we are looking at aquatic insects.

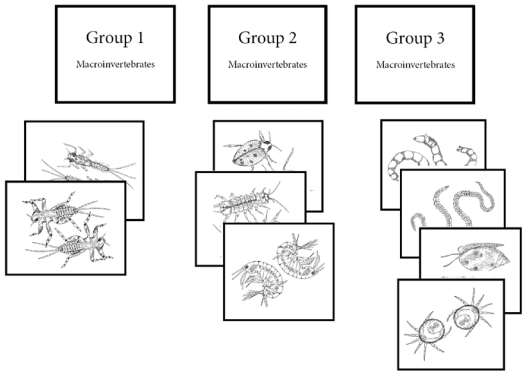
Why should we investigate the macroinvertebrates in the water?
These creatures are an important food source for young salmon fry growing in our rivers, lakes, and streams. We want to make sure there is plenty of food for our salmon. Additionally, these macroinvertebrates are sensitive to pollution and can show us how polluted the water is. If we find creatures from groups 1, 2 and 3: the water is very clean. If we find creatures only from groups 2 and 3 it means the water is polluted at a medium level. And if we find creatures only from group 3, the water is heavily polluted.

How to Use

Begin by printing the cards double sided (flip on long edge). Cut out the following macroinvertebrate cards. One side shows the picture of a macroinvertebrate, flip it over to learn its name, pollution tolerance level, and other fun facts!



Shuffle the cards and pull out 10. The following cards represent a sample found in Discovery Creek. Take a moment to identify the macroinvertebrates using the dichotomous key "Key to Macroinvertebrates in the River". Find out what their pollution tollerance levels are using the "Pollution Tollerance Index" sheet. Then complete the biotic index sheet to determine how healthy Discovery Creek is based on the sample you've collected. Try this multiple times by shuffling and pulling out a new sample.

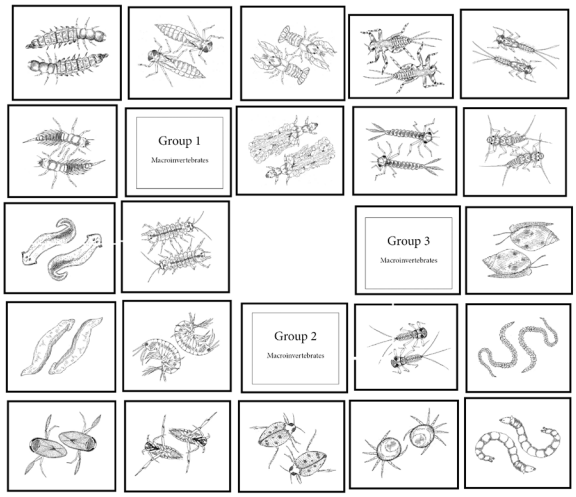


Alternative Games

Option 2: Stack it!
Organize all cards into their pollution tolerance group by guessing. Place them in piles or lines beneath the title card. Once finished, check to see if you got them right! Try again until you get them correct.

Option 3: Guess the Critter!
Do you know these creatures by name? Place all cards on a table picture up. Challenge a friend at identifying the macroinvertebrates. Take turns guessing and flipping cards. The person who collects the most macroinvertebrates wins!

Option 4: Habitat Investigation!
Visit a waterway near you and search for aquatic insects. Lay out the cards for the macroinvertebrates you found. Use these cards to determine how polluted your chosen waterway is. Pair this with our "Habitat Investigation" activity.



Scientist Name(s): _____

Date: _____ Time: _____ Weather: _____

Group 1 Species	**Number**	**Group 2 Species**	**Number**	**Group 3 Species**	**Number**
Caddisfly Larvae		Dragonfly Nymph		Water Boatman	
Mayfly Nymph		Damselfly Nymph		Backswimmer	
Stonefly Nymph		Alderfly Larvae		Snails	
Dobsonfly Larvae		Amphipods (Scuds)		Isopod	
		Crawling Water Beetle		Midge Larvae	
		Water Mite		Tubifex Worm	
		Crayfish		Flatworm	
Total Number of Species:		Total Number of Species:		Total Number of Species:	
Multiple total number x 3: (index value)		Multiple total number x 2: (index value)		Multiple total number x 1: (index value)	

Stream Quality Assessment

Total Number of Species (Sum of 3 group totals) ☐

Cumulative Index Value (Sum of 3 group index values) ☐

Check the box next to the corresponding Cumulative Index Value to determine Stream health

☐ Excellent (> 22)

☐ Good (17 – 22)

☐ Fair (11 – 16)

☐ Poor (< 11)

Macroinvertebrate: Pollution Tolerance Index

Group 1:

Caddisfly Larva

Water Penny

Riffle Beetle Larva

Stonefly Larva

Mayfly Larva

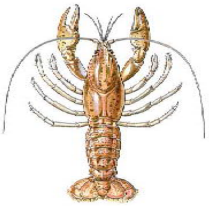
Dobsonfly Larva

Group one macroinvertebrates **CANNOT** tolerate pollutants in the water. They need **cold**, **clean** and **clear** water to survive.

Group 2:

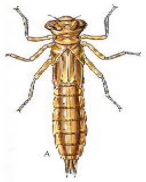
Scuds or Amphipods

Alderfly Larva



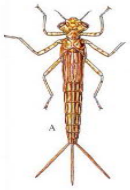
Crayfish

Crawling water Beetles



Dragonfly Nymph

Clams and Mussels



Damselfly Nymph

Water Mites

Group two macroinvertebrates can tolerate **SOME** pollutants in the water and can live in **medium** water quality conditions

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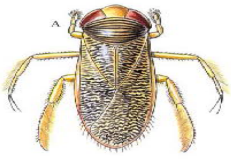
Group 3:

Aquatic Earthworm

Tubifex Worms

Leeches

Snails



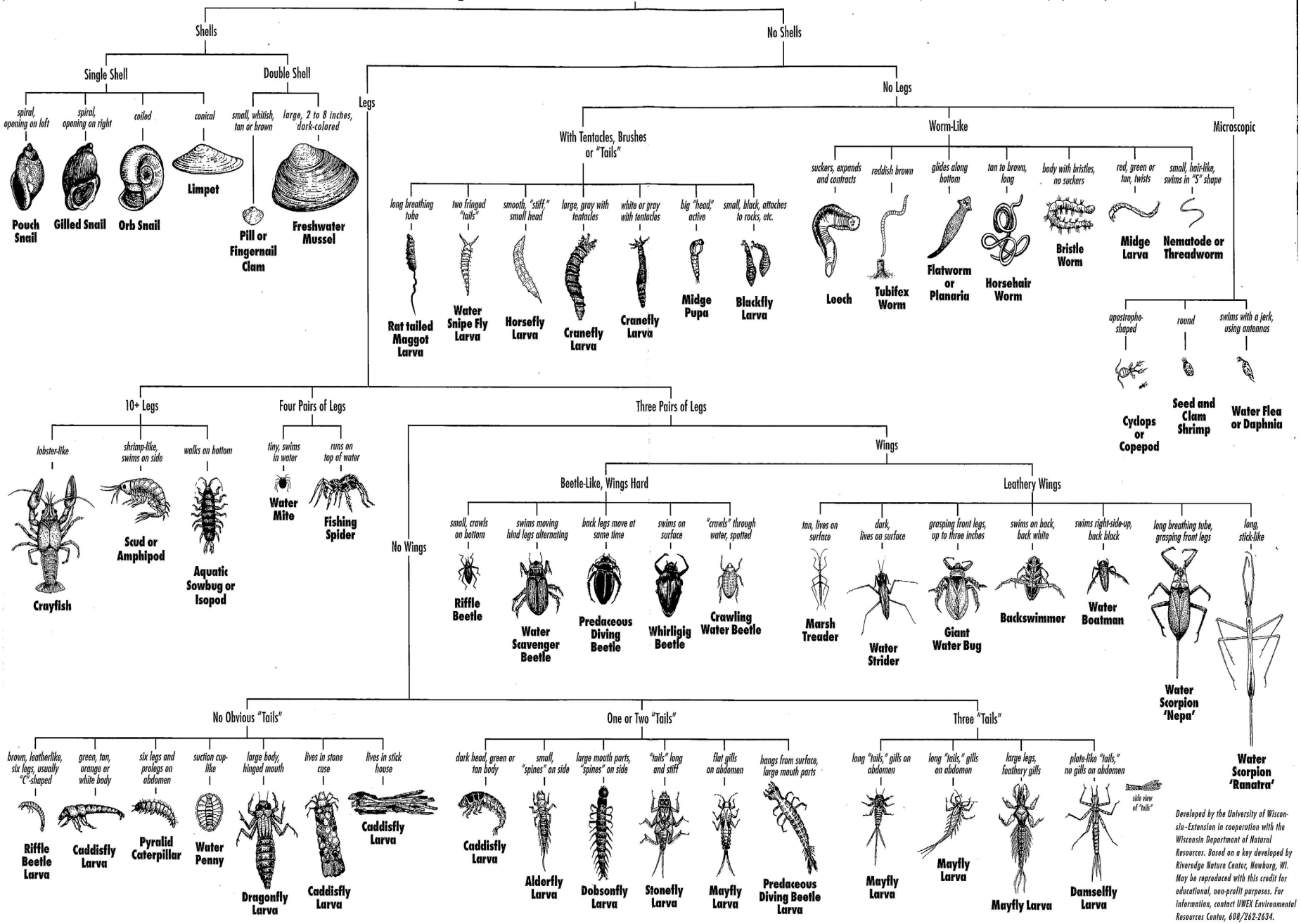
Water Boatmen

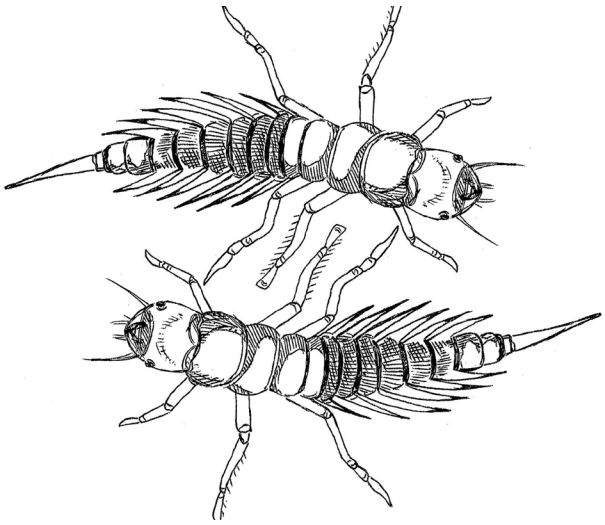
Midge Larva

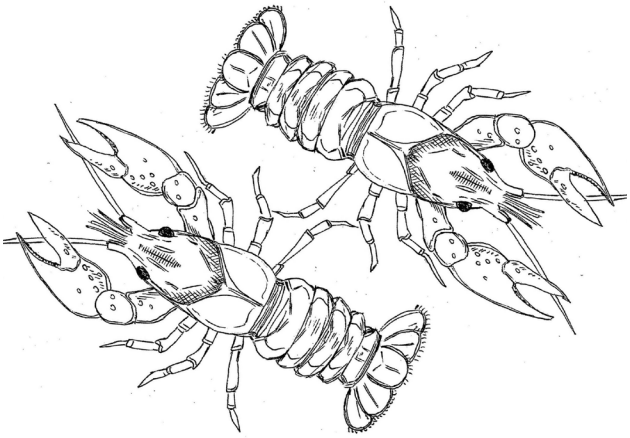
Group three macroinvertebrates **CAN** tolerate pollutants in the water and **poor** water quality conditions.

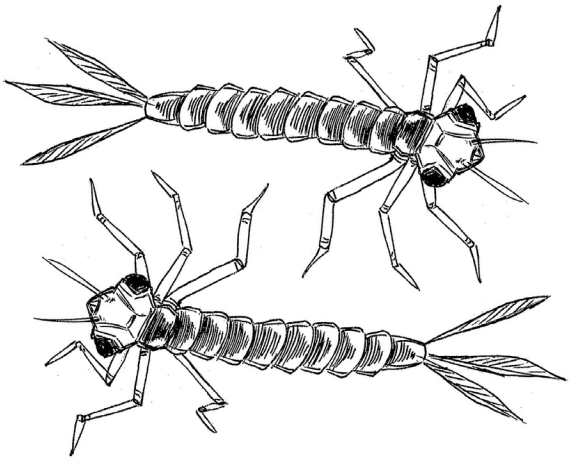
Key to Macroinvertebrate Life in the River

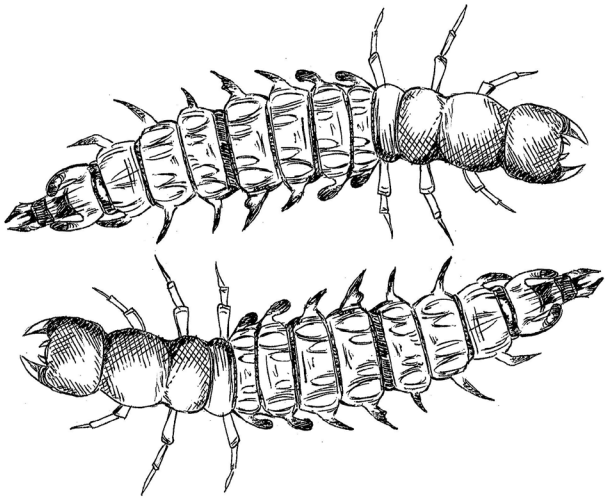
(Sizes of illustrations are not proportional.)

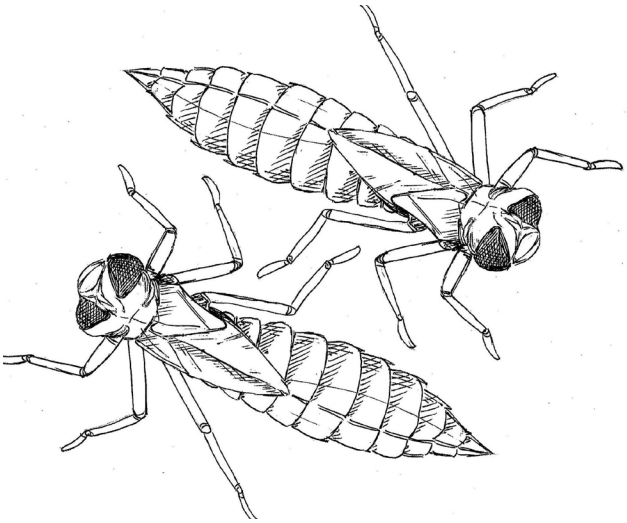












Crayfish

Pacifastacus leniusculus

Group 2

Washington has one native crayfish species called the signal crayfish.

They are invasive in Europe.

Can grow up to 17 centimeters long and live up to 20 years.

Alderfly Larvae

Sialidae

Group 2

There are about 66 species of alderfly on Earth.

The y live in water for 1-2 years before crawling onto land and growing wings.

They live three weeks as an adult, and stay clsoe to home.

Damselfly Nymph

Zygoptera

Group 2

Damselfies look like small dragonflies and are closely related. The males are brighter in color than the females.

Fossils that look like damselflies have been found as old as 250 million years.

They eat mosquitoes.

Caddisfly Larvae

Trichoptera

Group 1

Caddisflies build homes out of debris using silk from their saliva.

The homes have been turned into jewelry.

Once an adult, they become food for nocturnal birds, bats, amphibians, and small mammals.

Dagonfly Nymph

Anisoptera

Group 2

Dagronflies can live in the water for up to 5 years.

You can tell a dragonfly from a damselfly by looking at their wings. Dragonflies hold their wings flat and away from the body. Damselfies hold their wings folded along their bodies.

Dobsonfly Larva

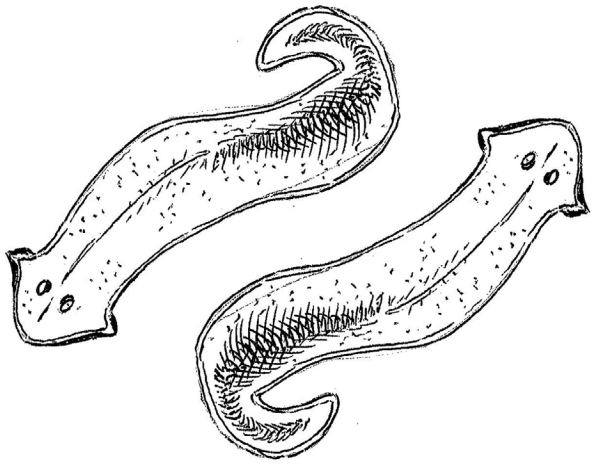
Corydalinae

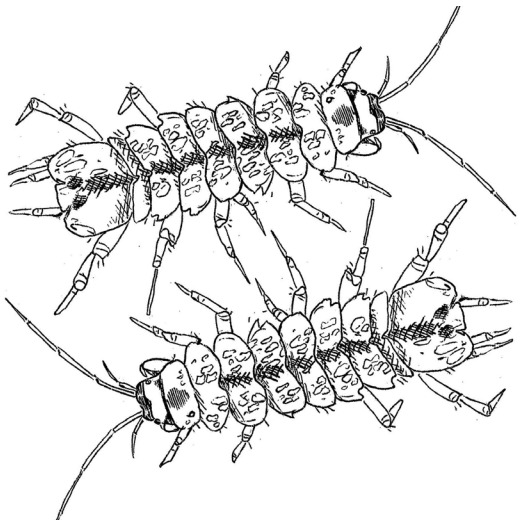
Group 1

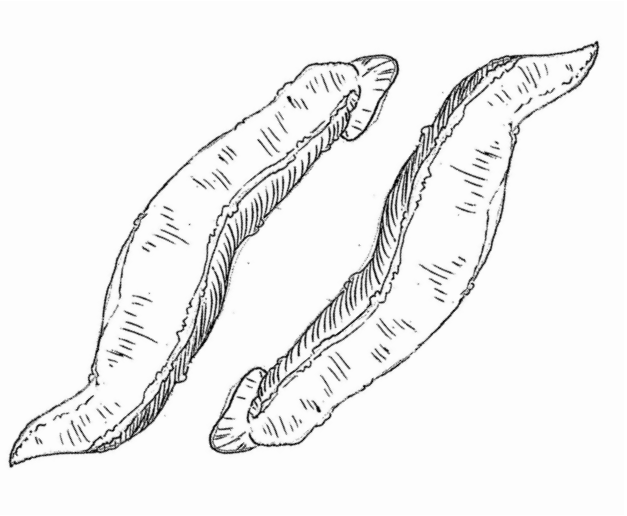
There are about 60 species.

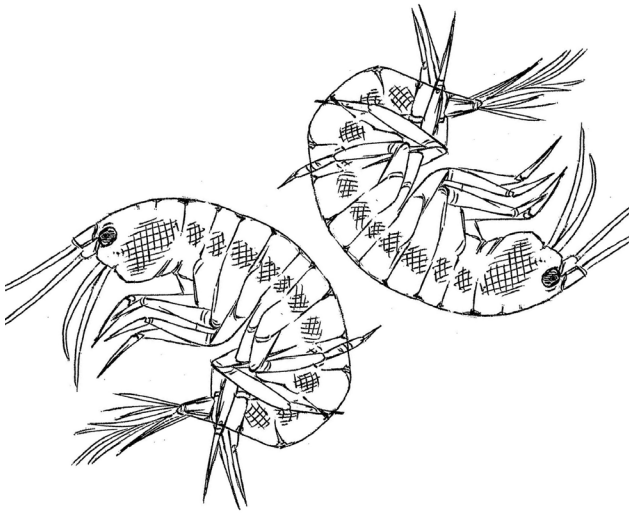
Adult dobsonflies are some of the largest isects in North America. With a wingspan can be 7 inches long.

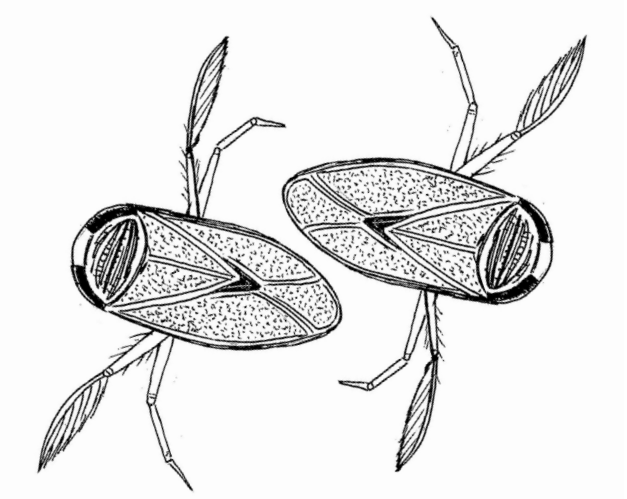
The adults are nocturnal and are seldom seen.

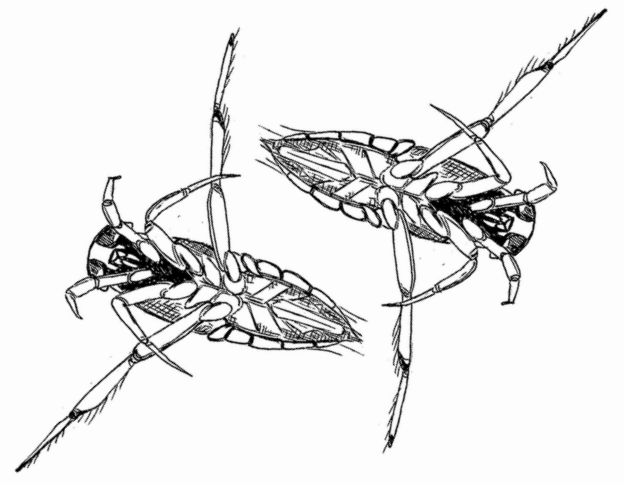












Isopod

Asellidae

Group 2

Isopods can be found on land, in freshwater, and saltwater. 500 species are found in freshwater.

Isopods are detritivores, herbivores, carnivores, parasites, and filter feeders.

“Isopoda” means “equal foot” in Greek.

Flatworm

Platyhelminthes

Group 3

There are 20,000 species of flatworms.

They are carnivores and scavengers.

The largest flatworms are only a few centimeters long.

Scud

Amphipoda

Group 2

Also called “amphipods” meaning “different foot” in Greek.

A type of crustacean, and a cousin to crabs.

Typically less than 10 millimeters long.

Leech

Hirudinea

Group 3

Leeches are parasitic animals related to earthworms.

The majority of leeches live in freshwater and suck blood from their host.

Leech fossils are 500 million years old.

Backswimmer

Notonectidae

Group 3

There are about 500 species of backswimers.

They use an oxygen bubble within them to stay bouyant.

You’ll find them near the surface swimming upsidedown.

Water Boatman

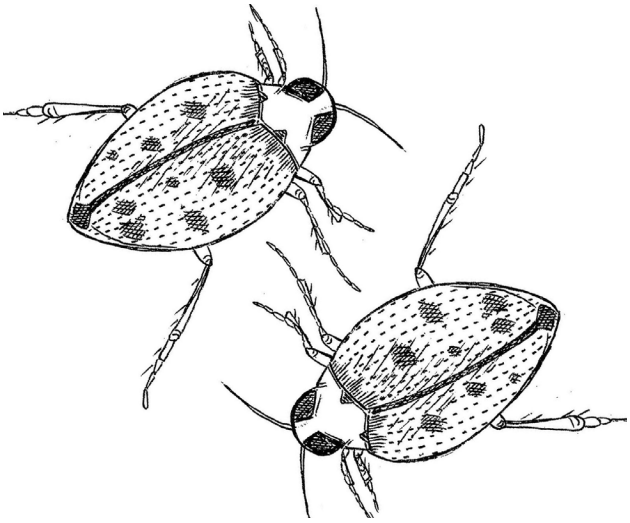
Corixidae

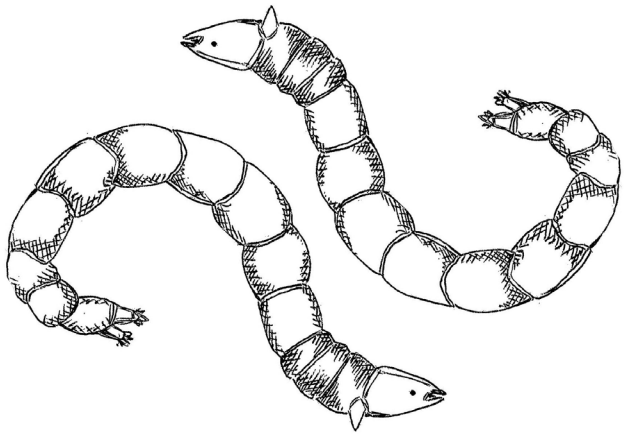
Group 3

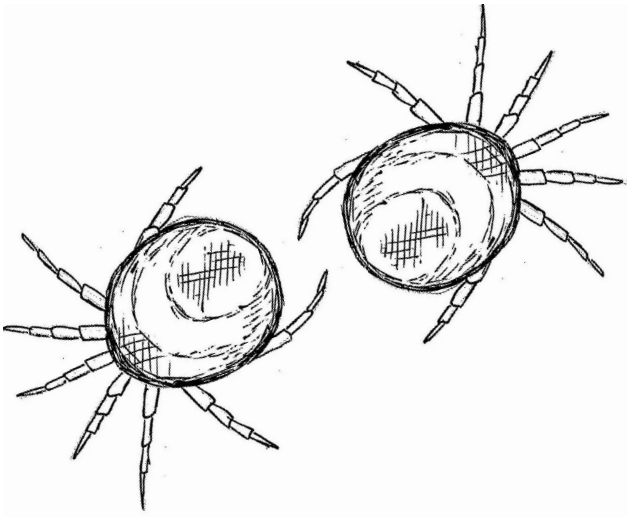
Closely related to backswimmers. While backswimmers swim upsidedown, water boatmen swim right side up.

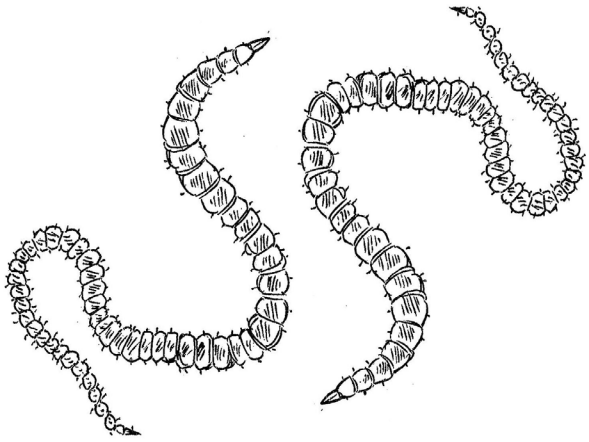
Their hind legs are covered with hairs and move like boat oars.

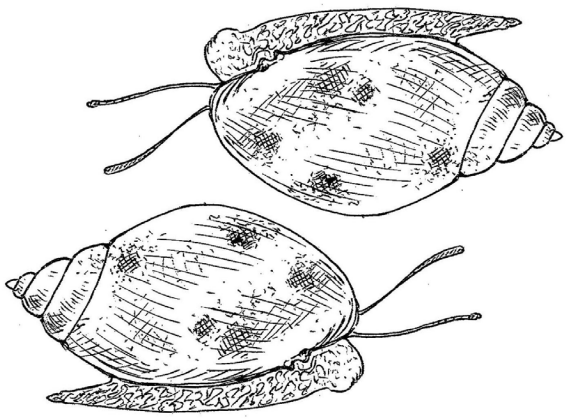
Common prey to amphibians.

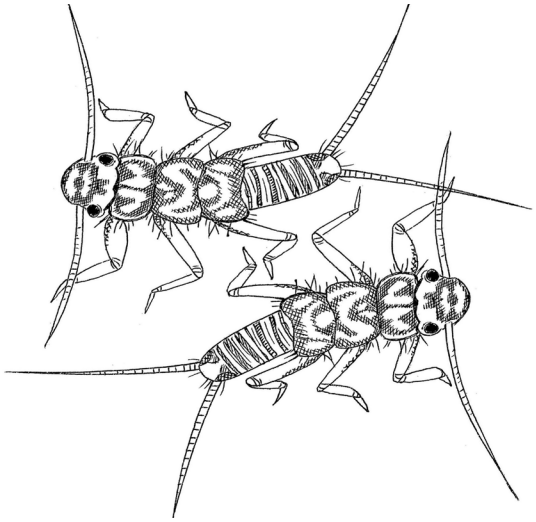












Midge Larvae

Chironomidae

Group 3

Midges are small flies including mosquitoes.

They are an important food source for amphibians and small birds.

Midges can be found practically everywhere on Earth.

Crawling Water Beetle

Haliplidae

Group 2

These aquatic beetles are clumsy swimmers and prefer to crawl.

They live in vegetation along the water's edge.

They eat insect eggs, small crustaceans like amphipods, and algae.

Tubifex Worm

Tubifex

Group 3

Also called "sludge worms" or "sewage worms" because they can be found in heavily polluted habitats.

They are hermaphroditic and an individual has both male and female reproductive parts.

Water Mite

Hydrachnidia

Group 2

Can be colored with bright red, orange, blue, green, and yellow.

The young are parasitic and can be found attached to mosquitoes.

They are found on every continent except Antartica.

Stonefly Nymph

Plecoptera

Group 1

"Plecoptera" means "braided-wings" in Greek.

The nymphs live in the water for 1-4 years before growing wings.

A female can lay 1,000 eggs which they drop into the water from the air.

Pouch Snail

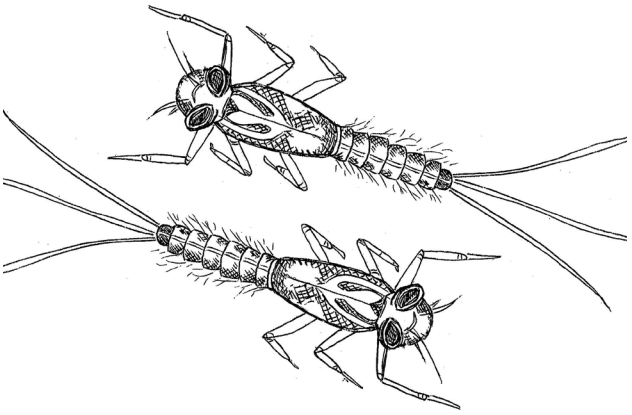
Physidae

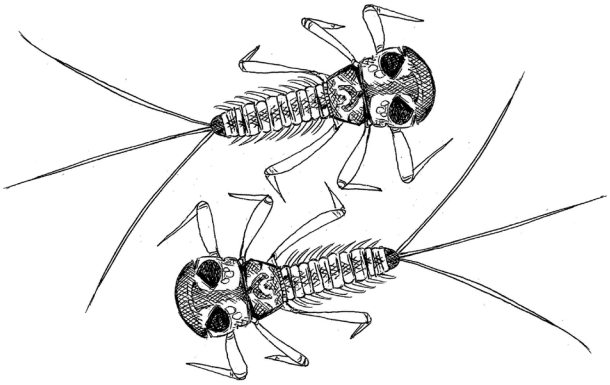
Group 3

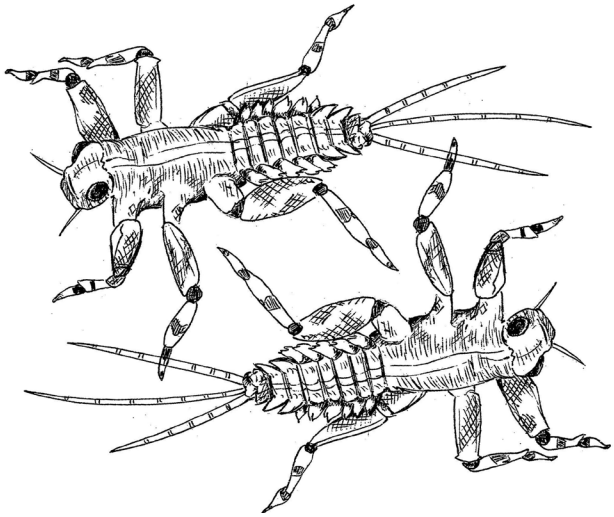
Also called "bladder snails" or "tadpole snails".

Many species are used in aquariums and pet store displays.

They are widspread, abundant, and tolerant of pollution.







Group 1

Macroinvertebrates

Group 2

Macroinvertebrates

Group 3

Macroinvertebrates

Flathead Mayfly Nymph

Heptageniidae

Group 1

The most abundant mayflies in flowing water.

Their flat bodies are adapted to cling to rocks in strong currents.

They eat algae, and scrap it off rocks.

Minnow Mayfly Nymph

Baetidae

Group 1

Their streamlined bodies make them excellent swimmers.

They are brown and green and can appear slightly translucent. This helps them camoflage among rocks and plants.

They live in the water for several years.

These macroinvertebrates CANNOT tolerate pollutants in the water.

They must have high water quality to survive: cold, clean, and clear water.

Spiny Crawler Mayfly Nymph

Drunella

Group 1

There are at least 20 species of Drunella mayflies.

Mayflies have four life stages and go from egg to nymph, subimago, and adult.

Mayflies are commonly used as inspiration and models for fishing lures.

These macroinvertebrates CAN tolerate pollutants in the water.

They can live in poor, medium, and high water quality conditions.

These macroinvertebrates can tolerate SOME pollutants in the water.

They can live in medium and high water quality conditions.